

Math F113X: Quiz 1

Name: Solutions score: \_\_\_\_ / 10

There are 10 points possible on this quiz. No aids (book, notes, etc.) are permitted. You may use a non-programmable calculator. **Show all work and supporting calculations for full credit. Explain how you get your answers.**

1. (6 points) The student government is holding elections for president. There are four candidates (A,B,C and D for convenience). The preference schedule is below.

number of voters	50	40	30	70	10
1st choice	B	C	B	A	D
2nd choice	A	D	D	C	B
3rd choice	C	A	C	B	C
4th choice	D	B	A	D	A

For each of the following, provide supporting calculations.

- (a) How many voters voted in this election? 200

$$50 + 40 + 30 + 70 + 10 = 200$$

- (b) How many voters are needed for a majority? 101

$$\text{half} = \frac{200}{2} = 100; \text{ Need } \underline{\text{more}} \text{ than half.}$$

- (c) What is the smallest number of voters that could give a candidate a plurality? 51

$$\frac{200}{4} = 50. \text{ Need more than } \frac{1}{4},$$

- (d) Find a winner under the plurality method. Show some work. B

vote tally (1 <sup>st</sup> place votes)	A	70	
	B	50 + 30 = 80	← the most 1 <sup>st</sup> place votes
	C	40	
	D	10	

- (e) Did the winner under the plurality method also win a majority? No

$$80 < 101$$

- (f) List at least one strength and at least one weakness of plurality as a voting system.

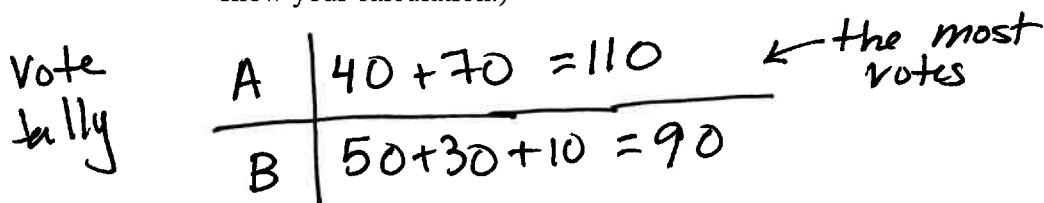
Strength: It's simple and fast.

Weakness: The winner may earn only a small minority of the vote.

2. (4 points) Below is the same preference schedule.

number of voters	50	40	30	70	10
1st choice	B	C	B	A	D
2nd choice	A	D	D	C	B
3rd choice	C	A	C	B	C
4th choice	D	B	A	D	A

- (a) In a one-to-one comparison, who is preferred, candidate A or candidate B? (You must show your calculation.)



Candidate A is preferred.

- (b) Determine if there is a Condorcet winner. If so, who is it? Otherwise, explain why not. The results of each one-on-one comparison (except A vs B) are provided below.

matchup	A vs C	A vs D	B vs C	B vs D	C vs D
tally	A: 120 C: 80	A: 120 D: 80	B: 90 C: 110	B: 150 D: 50	C: 160 D: 40
winner	A	A	C	B	C

= =  
A is a Condorcet Winner.

From part (a), A wins against B.

From the table, A wins against C and D.

So A wins every one-to-one comparison